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Field research to obtain information on the productivity of the cottontail rabbit (*Sylvilagus floridanus mearnsii* Allen) in Decatur County, Iowa, was conducted from March 27 to September 19, 1951. The 75-acre study area on a farm owned by Floyd Fleming is in Section 13 of Woodland Township, eight miles northwest of Lineville, Iowa.

The cover was analyzed and divided into units on the bases of cottontail range, cover use, and farm boundaries. In analysing the cover of the units four untilled cover types—trees, shrubs and vines, forbs, grasses—and four tilled crops were used. The untilled cover occupied 63 per cent of the area. Trees composed nearly three per cent of the untilled cover. A few of the most abundant trees were American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*) and shingle oak (*Quercus imbricaria*) along the gullies, and catalpa (*Catalpa speciosa*) in a grove. Common shrubs and vines were penicled dogwood (*Cornus racemosa*), coral-berry (*Symphoricarpos orbiculatus*), wild grape (*Vitis riparia*) and Virginia creeper vine (*Parthenocissus quinquefolia*). The shrub and vine type made up nearly three per cent of the untilled cover. The chief forbs were ragweeds (*Ambrosia* spp.), tickseed (*Bidens aristosa*), and partridge pea (*Cassia fasciculate*). Forbs were 43 per cent of the untilled cover. Grass formed 52 per cent of the total untilled cover. Blue grass (*Poa pratensis*), red top (*Triodia flavus*), poverty grass (*Aristida dichotoma*) and panic grass (*Panicum scribnerianum*) were the principal grasses. Twenty-eight acres, or 37 per cent of the total area, were in corn, oats, alfalfa and rye. The area was intersected by tree-bordered gullies up to 300 feet in length and 20 feet in depth. The gullies and rolling hills between them were prominent features of the area.

A maximum of 38 box-type traps were placed in suitable locations throughout the study area for use in the live-trapping and ear-tagging program. Numbered metal tags were placed as far down as possible on the base of the right ear of each trapped cottontail,

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along with a colored washer to designate sex. In addition to ear-tagging for marking, the rump and tail were painted yellow with a 75 per cent solution of ethyl alcohol and picric acid. When observations were made from a distance with a 7-power binocular, cottontails thus marked were separated from unmarked cottontails. The practice of flushing and observing cottontails to determine those not marked proved useful in placing traps.

In five and one-half months of live-trapping, 108 cottontails were trapped, of which 83 were juveniles. With data from retrapping 41 per cent of the 108, the length of life of a cottontail was estimated. A hind-foot growth rate constant of 0.6 mm per day for juvenile cottontails was determined and used to calculate litter emergence dates. Population estimates were made by adding the number of cottontails on the area in each week.

To determine productivity of the cottontail, losses and gains were considered in making a final calculation of increase after the influence of the decimating factors. This was done by determining the breeding stock, estimating gains and losses in population, and estimating the next year's mature breeding stock.

By the week of June 10-16, a mature breeding stock of 35 cottontails at a population density of 0.46 cottontail to the acre was on the area. Of these 35, 18 were females, at a sex ratio of 94 males to 100 females. The first nesting period began on March 28 when a litter was born, for which mating took place one month earlier. Using 15 days as the approximate in-nest period (Hendrickson 1943) this litter left the nest April 12. At least one litter left the nest in each week following April 30 up to June 30, the end of the first nesting period.

A peak in litter emergence came during the week of June 10-16 when three litters emerged from nests. In this week 122 cottontails were estimated on the area at a population density of 1.62 cottontails to the acre.

The first period ended in the week of June 24-30 when only one litter emerged from the nest while three litters had left nests during the previous week. Nineteen litters left nests in the 11 weeks of the first period. Using an average litter size of five cottontails (Hendrickson 1943), these 19 litters produced an estimated 95 juveniles. This is slightly more than one litter per female. Of these 95 juveniles, 17 were estimated lost on the area by June 30, at a survival rate of 80 per cent. Four adult males were lost by the end of this period, bringing the losses to 21. An estimated 124 cottontails, of which 93 were juveniles, were on the area at the close of the first

nesting period at a population density of 1.65 cottontails to the acre.

No litters left nests during the week of July 1-7; this separated the first and second litter emergence periods. During this week, 93 juveniles were on the area from litters produced before June 30. These increased to 97 make for a total population of 128, which was reduced to 124 by the end of the week.

New litters on the area at the beginning of the second litter emergence period during the week of July 8-14 increased the population to 129 cottontails, of which 101 were juveniles, at a density of 1.72 cottontails to the acre. The 129 cottontails on the area in this week resulted in the highest population density at any time during the study. The greatest number of juveniles was present on the area in the week of July 22-28, which was preceded by another peak of three litters emerging from nests. In the weeks of July 22-28 and August 5-11, a high in the number of litters emerging from nests was noted and a corresponding peak was recorded two weeks earlier for the number of cottontails on the area. This agreed in time with a 15-day in-nest period.

For the three-week period, between August 11 and September 1, no litters left nests on the study area. In the week of September 2-8, the end of the second period, one litter left the nest. A total of 10 litters left nests during the second period, producing an estimated 51 juvenile cottontails. Of these 51, 45 were on the area September 8 at a loss of 11.7 per cent. These 45 juveniles were equal to nine litters produced in the second emergence period that lived to September 8. On that date, of a total of 67 juveniles estimated present on the area, 22 or 46 per cent had left nests in the first litter emergence period. This was equal to 4.4 litters. Only four of the original mature breeding stock were known to be on the area at the end of field work September 19. The ingress of 12 full-grown cottontails onto the area during September was added to the population estimate for September 19, the end of field work.

The total population for September 19 was determined by the simple proportion—the number of marked rabbits caught in the second period/ total second catch = number of rabbits tagged in first period/ the total population. Thus:

$$46/88 = 40/X$$

$$X = 76$$

After subtracting the four adults remaining of the original 35 and the 12 ingress cottontails, 60 young were left. These 60 juveniles represented an increase of 171 per cent over the original breeding stock. The 76 cottontails on the area at the close of the study,

September 19, furnished a population density of slightly more than one cottontail to the acre.

Nine juveniles were estimated lost between the end of field work and October 31. Assuming that the four adults present September 19 lived until October 31 and the ingress cottontails remained on the area, the total population on October 31 was 67. Of these, 51 were juvenile born during the 1951 nesting season, at an increase of 146 per cent over the mid-June breeding stock. If all cottontails, including adults, juveniles, and ingress, had lived until the end of October, 181 cottontails would have been present on the area at a population density of 2.4 to the acre. Since only 67 were on the area October 31, a loss of 63 per cent resulted. The 67 cottontails present October 31 were at a population density of 0.89 to the acre.

In summary, on a 75-acre tract bearing 37 per cent cultivated crops and 63 per cent untilled cover in Decatur County, Iowa, a maximum seasonal breeding stock of 35 cottontails was determined with trapping, tagging and retrapping techniques, and flush counts. On the basis of 83 trapped, measured and tagged juveniles, assigned to 29 litters, an estimated 145 young were born between March 28 and September 6. Retrapping data indicated that 60 of the young cottontails remained on the area September 19. The productivity as of that date was 171 per cent of the breeding stock of 35 adult cottontails.

Literature Cited

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